

missiles and rockets

THE WEEKLY OF SPACE SYSTEMS ENGINEERING



House

Details of Soviet ABM Revealed

U. S. Will Build Space Stations

NASA Eyes New Oxygen System

DOD Contractor Rating Outlined

Wallops Scout Launcher

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MAGAZINE

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THE WEEKLY OF SPACE SYSTEMS ENGINEERING

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THE COVER

Scout launcher is shown lifting the rocket from its truck cradle at Ling-Temco-Vought's Chance Vought Astronautics Div., Dallas. The launcher will soon go to work at NASA's Wallops Island facility, increasing the center's potential launch rate. See page 41.



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† U.S. Reg. Pdg.



Soviets May Have Ultimate ABM

Electromagnetic energy from high-yield blast might neutralize U.S. missiles in silos, leaving 'Maginot Line' deterrent

THE SOVIET UNION may be developing an anti-ballistic missile system capable of de-activating U.S. missiles in their silos with the electromagnetic energy from exploding high-yield Soviet nuclear weapons, MISSILES AND ROCKETS has learned.

This possibility, supported by U.S. intelligence-gathering on the 1961-62 Soviet high-yield test series, is behind strong opposition by many high military officers and nuclear scientists to the test ban treaty.

The Soviet lead in anti-ballistic missile development has been acknowledged even by Administration supporters in the test-ban debates. It is based on the long-range ability of strong electromagnetic pulses to cripple the electronics system of a missile so that it cannot be fired.

It could mean that the U.S. has invested billions of dollars in a "Maginot Line" of *Atlas*, *Titan* and *Minuteman* missiles that could be rendered useless by the new Soviet development.

● **Polaris safe**—*Polaris* missiles beneath the sea would be relatively immune, as would manned bombers on patrol far from U.S. shores.

This point was made by Dr. Edward Teller when he told the Senate: "By expanding and perfecting the *Polaris* missile system, we could ameliorate the situation."

U.S. knowledge of Soviet developments in this area has been given the highest national security classification and has been discussed only in closed sessions of Senate committees considering the treaty.

U.S. information comes from monitoring satellite, aircraft and other intelligence sources.

Soviet achievement of such a capability could effectively neutralize the major portion of the U.S. deterrent force in its silos, this magazine is told.

This belief is based on the fact that

U.S. military strategy relies on second-strike capability, which concedes the first strike to the Soviet Union and bases the U.S. deterrent on the ability to survive the initial attack and still retaliate.

● **No second strike**—Achievement by the Soviets of the capability of using their first strike offensive weapons simultaneously as defensive weapons that

would destroy the electronics of U.S. silo-based missiles could wipe out the ability of the U.S. to retaliate.

This fear was expressed in depth by Gen. Thomas S. Power, commander of the Strategic Air Command, in his testimony before a closed session of the Senate Preparedness Investigating Subcommittee. The testimony was severely censored before release, with any reference to electromagnetic pulse (EMP) phenomenon deleted from the text.

The possible effect of the burst of electromagnetic energy from an exploding high-yield weapon on the electronic circuitry of a missile is described as similar to what happens when lightning strikes a radio. It is believed to be capable of fusing wires, burning out circuits, and causing other extensive damage that would leave the missile inert in its silo, incapable of being fired or easily repaired.

In an article on radiation effects (M/R, Sept. 9, p. 19), John Crittenden, consultant in this field for General Electric, stated last week: "The detonation of (nuclear) weapons produces radiation over the entire electromagnetic spectrum.

"The prompt gamma pulse will affect electronic devices sensitive to ionization, and the radio-frequency signal propagated carries enough energy to damage electronic circuits drastically. . . ."

Experiments have shown these electromagnetic effects are effective far beyond the normal heat and blast effects of an explosion. In space, a one-megaton explosion can harm electronic systems over a radius of 110 miles or more, according to GE.

Extrapolation of this information to the effects of perhaps a 60-megaton Soviet weapon exploded in the atmosphere is difficult. This is one reason some U.S. military officers and scientists would like to see the U.S. undertake high-yield testing.

AFA Opposes Treaty

The Air Force Assn., on the first day of its annual convention last week in Washington, went on record opposing ratification of the test ban treaty.

Stating that the treaty would pose "unacceptable risks to the security of this nation and of the free world," the AFA reflected much of the opposition expressed before recent Senate hearings by Strategic Air Command chief Gen. Thomas S. Power.

The majority of the 400 delegates expressed particular concern over the disagreement of weapons experts as to the magnitude of the risks involved. The 74,000-member body expressed doubt that the possible political gains offered by the treaty would offset its dangers.

Rather than committing the U.S. to what it terms a nuclear stalemate policy and "an open invitation to Soviet aggression on terms which the free world cannot meet and is not prepared to meet," the AFA proposed a return to the "pursuit of nuclear superiority." The Association said that such a superiority, when it belonged to the U.S., had been the key to maintaining peace.

It is known that pulse radiation of Soviet high-yield nuclear tests in 1962 crippled the electronics of a U.S. satellite, possibly the one used to monitor those same electromagnetic effects.

● **Hardware affected**—The destructive effects of electromagnetic pulse on electronic systems include deterioration of semiconductors, current leakages, displacement or breaking of printed circuits and swelling of potting compounds and insulation used in electronic hardware.

As an example of the range of the effect, it can be disclosed that one of the U.S. nuclear tests in Nevada popped circuit breakers on power lines more than 100 miles away in California. Nevada tests are restricted to yields of 20 kilotons or less.

A Russian warhead of, for example, 60 megatons, releases most of its energy in the form of velocity of particles. This leaves about 10%—5% conservatively—distributed across the electromagnetic spectrum from hard protons of the gamma type all the way down to the very soft radio waves. One scientist emphasized to M/R, “. . . and 5% of 60 megatons is one helluva lot of energy.”

In regard to electromagnetic effects of high-yield weapons, Dr. John S. Foster, Jr., director of the Lawrence Radiation Laboratory at Livermore, Calif., told the Senate Foreign Relations Committee Aug. 21 “It is simply that the question of how hard anything is to electromagnetic phenomena, be it anti-ballistic missile defense or hardness of silos, has to do with matters that, in my opinion, are not sufficiently well understood to be able to say with full confidence that they will function as designed in a nuclear environment.”

He warned the committee that it would be taking an incalculable risk with the security of the country if it approved a treaty prohibiting further testing in the atmosphere.

The U.S. military already is financing development of electronic equipment less sensitive to radiation than that now used in U.S. missiles, but its effectiveness against high-yield explosions will be questionable.

● **Filling in the blanks**—With EMP in mind, examination of Gen. Power's testimony before the Senate subcommittee makes clear his concern with the phenomenon. (In the testimony quoted below, deletions made for security reasons have been replaced by the language which might have been used. This deletion and its replacement is indicated in italics.)

SEN. STROM THURMOND (D-S.C.): “If we are going to secure the second strike, then we have to be sure that our missiles can make that strike. And if (the Soviets) have tested and found out

Thurmond Statement

Sen. Strom Thurmond (D-S.C.), a member of the Senate Armed Services Committee, asked about the seriousness of the effect of electromagnetic radiations on missiles in silos, told MISSILES AND ROCKETS:

“By virtue of its large multi-megaton weapons tests, and what we know of these tests, we must assume that the Soviet Union has acquired a uniquely valuable body of data on radiation and electromagnetic phenomenon which is not now available to the United States and which cannot be acquired without atmospheric testing.

“Under such circumstances, we have a much lower confidence factor in the reliability of our *Titan* and *Minuteman* systems than would be the case were we in possession of such knowledge. This is among the most serious consequences which would flow from the test ban treaty if ratified.”

certain weapons effects and have found out that a certain yield weapon or a certain strength weapon can destroy our missile sites or destroy the *electronics* system, and if we cannot test any more to catch up with the knowledge they have gained, then can we assure immunity of our second strike, of our second missile system?”

GEN. POWER: “I would say this would be a tremendous advantage to the Soviet Union and a tremendous disadvantage to us, again depending on what they have found out.” (This was followed by a classified discussion of EMP).

SEN. THURMOND: “And if they render our missiles inoperational through the knowledge they have gained and through the power they will have with this strike . . . then if that situation should come to pass, we don't have the manned bombers to make it, then where would we be?”

GEN. POWER: “We would be in trouble if this *electromagnetic* weapons effects phenomenon actually was as you described it. The point is I think we must find out. We must determine whether or not these things are true.”

The reference by Sen. Thurmond to rendering missiles inoperational, in contrast to their destruction by blast or heat, may be considered a significant clue to the importance of EMP. Hardening and dispersal of U.S. missile sites had been based on calculation of heat and blast effects which would require almost a

direct hit to destroy a missile in its silo. EMP, however, might be capable of incapacitating a great number of missiles at once.

● **Target programming erased**—The all-inertial guidance system of U.S. missiles such as *Atlas F*, *Titan II* and *Minuteman* are based on storing of target and guidance data on magnetic tapes or drums. In *Minuteman* silos, for example, a magnetic drum mounted on the silo wall contains information on more than one target, with selected target data fed to the missile before launch. A burst of electromagnetic energy might be capable of erasing such information, according to informed sources.

Gen. Power told the subcommittee that if it is found that a high-yield nuclear weapon has such destructive electromagnetic effects, the U.S. would want to employ its own ICBMs to do double duty as anti-ballistic missile system.

“That would give you much greater capability automatically,” he said. “So it is a two-edged sword.”

The subcommittee in its report to the Senate, after listening to 21 military and scientific witnesses, declared:

“The Soviets have overtaken and surpassed us in design of very high-yield nuclear weapons. They may possess knowledge of weapons effects and anti-ballistic missile programs superior to ours.”

● **Russian test aims**—It noted that the character of the recent Soviet high-yield tests indicated they were centered upon anti-ballistic missile development. The report stated:

“It is prudent to assume that the Soviet Union has acquired a unique and potentially valuable body of data on high-yield blast shock, communications blackout and radiation and electromagnetic pulse phenomena which is not available to the United States.”

But concern over what lessons may have been learned from high-yield tests was not limited to EMP. A “Hill” spokesman said there may be other “exotic” effects.

Sen. Robert C. Byrd (D-W. Va.), a member of the Armed Services Committee, was preparing last week to make a speech to the Senate floor expressing his fear that the Russians, through their high-megaton explosions, have gained other technical advantages the U.S. may not possess.

These, he felt, might enable them to create a communications blackout that could render U.S. missile sites, silos and electronic equipment useless. Sen. Byrd also was expected to point out his suspicion of the fact that the Russians, after previously refusing to sign test ban treaties, have reversed themselves about a year after conclusion of their last series of tests, about the time it might have taken to analyze the data. ■